

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE STANDARD**  
**MULCHING**

(Ac.)

**CODE 484****DEFINITION**

Applying plant residues, by-products or other suitable materials produced off site, to the land surface.

**PURPOSE**

- Conserve soil moisture
- Moderate soil temperature
- Provide erosion control
- Suppress weed growth
- Establish vegetative cover
- Improve soil condition and increase soil fertility

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to all lands where mulches are needed. This practice may be used alone or in combination with other practices.

**CRITERIA****General Criteria Applicable To All Purposes**

The selection of mulching materials will depend primarily on site conditions and the material's availability. Mulch materials shall consist of natural and/or artificial materials such as plant residue, wood bark or chips, by-products, gravel, plastic, fabric, animal manure, rice hulls, and materials from food processing plants or other equivalent materials of sufficient dimension (depth or thickness) and durability to achieve the intended purpose for the required time period.

Mulching is generally performed after grading, soil surface preparation and seeding and plantings are complete. Soil surface shall be prepared in order to achieve the desired purpose.

The mulch material shall be evenly applied and

anchored to the soil. Tackifiers, emulsions, pinning, netting, crimping or other acceptable methods of anchoring will be used if needed to hold the mulch in place for specified periods.

Manufactured mulches shall be applied according to the manufacturer's specifications.

Mulching operations shall comply with federal, state and/or local laws and regulations during the installation, operation and maintenance of this practice.

Mulch material shall be relatively free of disease, noxious weed seeds, and other pests and pathogens.

**Additional Criteria To Conserve Soil Moisture**

Mulch materials applied to the soil surface shall provide at least 60 percent cover to reduce potential evaporation. Using small grain straw this will be at least 1650 lbs/ac and for corn stalks, it will be at least 2650 lbs/ac.

Mulch material shall be applied prior to moisture loss. Prior to mulching, ensure soil under shallow rooted crops is moist, as these crops require a constant supply of moisture.

**Additional Criteria To Moderate Soil Temperature**

Mulch materials shall be selected and applied to obtain 100 percent coverage over the area treated. This will take about 7250 lbs/ac small grain straw. If the material is needed more than 3 months, increase the amount applied by 20%.

**Additional Criteria To Provide Erosion Control**

When mulching with cereal grain straw or grass hay, apply in sufficient amounts to provide 70 percent ground cover. This will take about 2150 lbs/ac small grain straw. All long strawed erosion mulch material shall be anchored or

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lined using a straight coulter or disk implement.

When mulching with wood products such as wood chips, bark, or shavings or other wood materials, apply to a 2-inch thickness if the soil is not well-drained, and to a 3- to 4-inch thickness if drainage is good. More finely textured mulches, which allow less oxygen penetration than coarser materials, should be no thicker than 1 or 2 inches. The mulch material shall provide no greater than 80 percent ground cover in order to ensure adequate air exchange.

Gravel or other inorganic material shall be applied approximately 2 inches thick and shall consist of pieces 0.75 to 2 inches in diameter. The mulch material shall provide no more than 90 percent ground cover in order to ensure adequate air exchange.

**Additional Criteria To Suppress Weed Growth**

The thickness of mulch will be determined by the size of the plant being mulched. Small plants must not be smothered. Mulches shall be kept clear of the stems of plants where disease is likely to occur. Mulches applied around growing plants or prior to weed seedling development shall have 100 percent ground cover. For small grain mulches this is at least 7250 lbs/ac or at least 166 lbs/ac per 1000 sq. ft. The thickness of the mulch shall be a minimum of 2 inches. Plastic mulches may also be used.

**Additional Criteria To Establish Vegetative Cover**

Mulch shall be applied at a rate that achieves 50 percent ground cover to provide protection from erosion and runoff and yet allow adequate light and air penetration to the seedbed to ensure proper germination, emergence, and disease suppression. This would be about 1200 lbs/ac small grain straw.

**Additional Criteria To Improve Soil Condition And Increase Soil Fertility**

To increase soil fertility, apply mulch materials with a carbon to nitrogen ratio (C:N) less than 25 to 1 such as animal manure, bio-solids, food processing wastes, or similar materials. C:N ratio materials greater than 25 can be used if

supplemental N is applied as listed in Table 1. Apply other practices such as Irrigation Water Mgt., Nutrient Mgt., Filter Strips or Riparian Forest Buffers to assure that runoff from the mulched areas will not transport mulching materials to sensitive waterbodies. Do not apply mulch with C:N less than 20:1 to the area of designed flow in watercourses.

**Table 1: Carbon/nitrogen ratios and nitrogen fertilizer requirements.**

Material	Estimated C:N <sup>1</sup>	Pounds N/dry ton <sup>2</sup>	Pounds 33-0-0 <sup>3</sup> N/dry ton	46-0-0 <sup>4</sup>
Sewage sludge	12:1	-	-	-
Alfalfa	13:1	-	-	-
Sheep manure <sup>5</sup>	17:1	-	-	-
Beef cattle manure	17:1	-	-	-
Swine manure	17:1	-	-	-
Poultry manure	18:1	-	-	-
Dairy cattle manure	25:1	8	24	17
Horse manure	50:1	24	73	52
Small grain straws, corn stalks	80:1	30	91	65
Sawdust, wood chips	400:1	38	115	83

<sup>1</sup>A C:N less than 20:1 probably would not result in immobilization of the soil nitrogen.  
<sup>2</sup>This calculation assumes an average of 40 percent carbon for all of the materials listed.  
<sup>3</sup>33-0-0 is ammonium nitrate or NH<sub>4</sub>NO<sub>3</sub>.  
<sup>4</sup>46-0-0 is urea or CO(NH<sub>2</sub>)<sub>2</sub>.  
<sup>5</sup>All animal manures are assumed to be dry and to contain **no bedding material**. If bedding material were present, C:N would be even higher and more nitrogen fertilizer would be needed.

Credit nutrients applied with the mulch to the nutrient budget. Table 1 from CSU Organic Materials as Nitrogen Fertilizers shows the amount of N needed to be add to various types of mulch materials to maintain a balance release of nutrients.

Use the Soil Conditioning Index to assess soil quality impacts. Mulching will cause the index to become more positive.

**CONSIDERATIONS**

Consider the effects of mulching on evaporation, infiltration and runoff. Mulch material may affect microbial activity in the soil surface, increase infiltration, and decrease runoff, erosion and evaporation. Increased infiltration may increase nutrient and chemical transport below the root zone. The temperature of the surface runoff may also be lowered.

Mulched soil retains moisture, requires less watering and reduces the chance of water stress on plant materials. Mulch also minimizes evaporation from the soil surface and hence reduces losses from bare soil areas.

Mulch materials high in organic matter with a high water holding capacity and high

impermeability to water droplets may adversely affect the water needs of plants.

Clear and infra-red transmissible (IRT) plastics have the greatest warming potential. They are transparent to incoming radiation and trap the longer wavelengths radiating from the soil. Black mulches are limited to warming soils by conduction only and are less effective.

Clear mulches allow profuse weed growth and may negate the benefits of soil warming. Black mulches provide effective weed control. Wavelength selective (IRT) blends the soil warming characteristics of clear mulch with the weed control ability of black mulch.

Consider potential toxic allopathic effects that mulch material may have on other organisms. Animal and plant pest species may be incompatible with the site.

Consider the potential for increased pathogenic activity within the applied mulch material.

Keep mulches 3 to 6 inches away from plant stems and crowns to prevent disease and pest problems.

Deep mulch provides nesting habitat for ground-burrowing rodents that can chew extensively on bark on tree trunk and/or tree roots. Light mulch applied after the first cold weather may prevent rodents from nesting.

Choice of mulch material should be determined by site characteristics, availability of mulch material, planned use, cost, and effectiveness.

Generally hay or straw are very effective and cost competitive. Chemical soil binders are effective in reducing erosion but have not been as successful as other materials for stand establishment. Bark or wood chips have been less effective than straw or hay per unit of weight. Excelsior blanket or jute netting are effective but costly. Gravel mulch is an effective insulator and provides good micro-climate for seed germination. Farm or manufacturing by-products such as cotton burrs, manure, corn or sorghum stalks are satisfactory mulches when adequate amounts are applied.

Nearly any material which protects the soil surface from the ravages of wind and water erosion is generally beneficial for seedling

establishment. However, placement of seed at the proper depth and providing good seed-soil contact without air pockets and then applying mulch is nearly always more successful than using methods which mix seed and mulch (hydro-seeding—mulching). When seed is mixed with the mulch, a light rain may cause germination and then seedlings die before they can make good soil contact.

## PLANS AND SPECIFICATIONS

Specifications shall be prepared for each site and purpose and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.

Documentation shall include:

- Type of mulch material used
- Percent cover and/or thickness of mulch material
- Timing of application
- Site preparation
- Listing of netting, tackifiers, or method of anchoring, and
- Operation and maintenance.

## OPERATION AND MAINTENANCE

Mulched areas will be periodically inspected, and mulch shall be reinstalled or repaired as needed to accomplish the intended purpose.

Removal, incorporation, bio- or photo-degradation of mulch and associated materials shall be consistent with the intended purpose and site conditions.

Operation of equipment near and on the site shall not compromise the intended purpose of the mulch.

Prevent or repair any fire damage to the mulch material.

Properly collect and dispose of artificial mulch material after intended use.

Monitor and control undesirable weeds in mulched areas.

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